Limb Correction of RGB Composite Imagery for Improved Interpretation

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RGB (Red-Green-Blue) imagery, created by integrating several spectral channels into one composite image, is currently used by the operational weather community to aid in quick, real-time analysis of atmospheric processes. However, the limb effect – a result of an increasing optical path length of the absorbing atmosphere between the satellite and the earth as scan angle increases – interferes with the qualitative interpretation of RGB composites at large scan angles. It also makes the comparison of similar products from multiple satellite sensors difficult. Recent work has indicated that correcting for the limb effect in the basic channel imagery using simple statistical relationships greatly improves the utility of the derived RGB imagery. However, it is hypothesized that the limb correction coefficients vary with respect to latitude, season, cloud cover, and surface albedo. This poster will highlight an improved approach to the limb correction of RGB imagery using varying coefficients. The Joint Center for Satellite and Data Assimilation (JCSDA) Community Radiative Transfer Model (CRTM) was used to simulate top of atmosphere brightness temperatures at varying scan angles for infrared channels corresponding to the Aqua and Terra Moderate Resolution Imaging Spectroradiometer (MODIS), Suomi NPP Visible Infrared Imaging Radiometer Suite (VIIRS), and Meteosat-10 Spinning Enhanced Visible and Infrared Imager (SEVIRI) sensors. A subset of European Center for Medium-Range Weather Forecasts (ECMWF) temperature, specific humidity, and ozone mixing ratio profiles from March 2013 through February 2014 were used as input to the CRTM. The simulated brightness temperatures were used to determine the best fit slope of the linear relationship between the natural log of the cosine of the scan angle and the difference of the simulated brightness temperature at nadir and on the limb. The correction coefficients were then analyzed for variability with respect to latitude, season, cloud cover, and surface type and used to produce improved limb corrected imagery. Applications of the results will be presented.